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HYDROLOGY OF THE FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

REGIONAL AQUIFER-SYSTEM ANALYSIS



U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1403-D

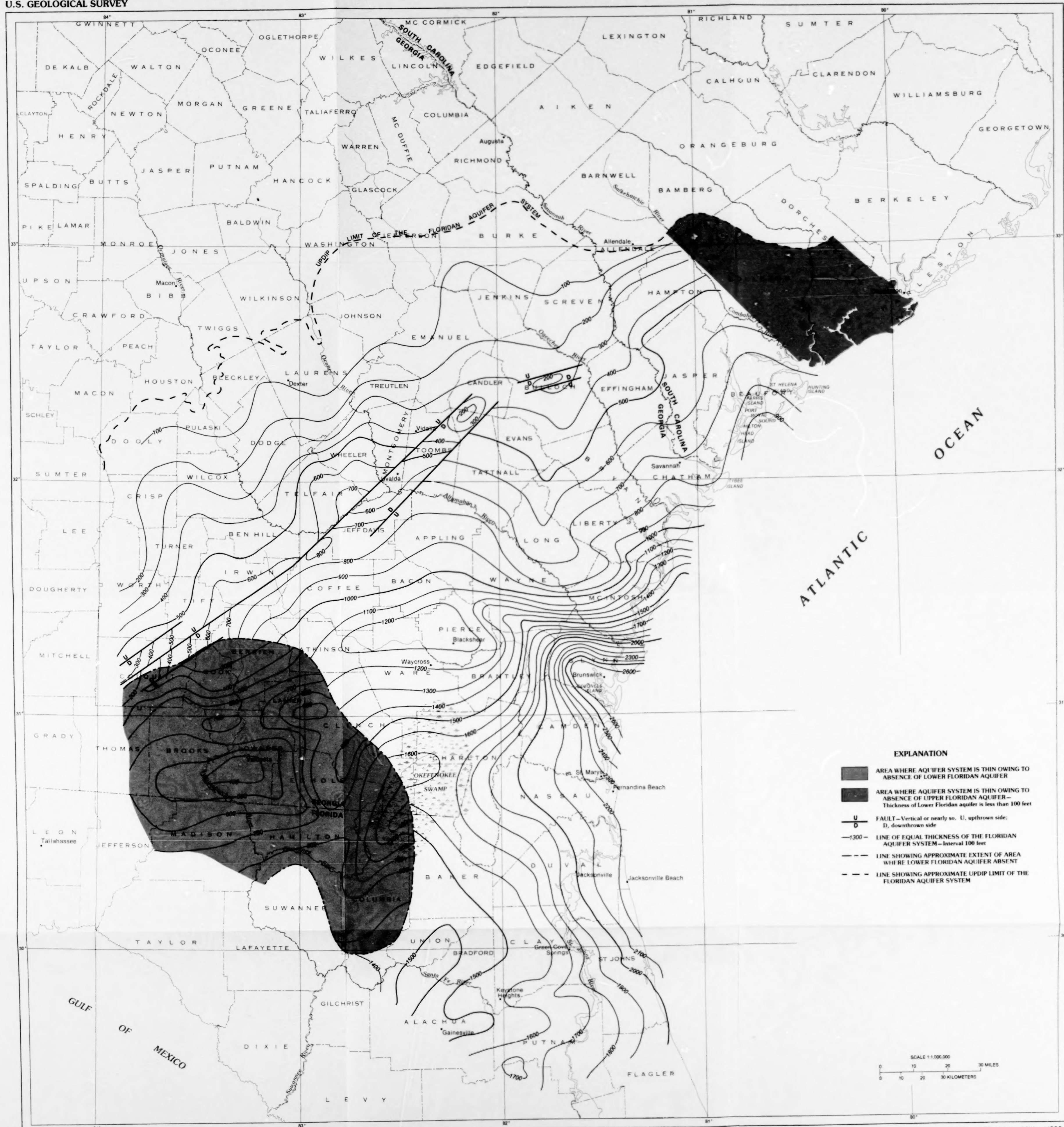
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TABLE 2

TABLE 2.—Generalized correlation of Coastal Plain stratigraphic units, lithology, and hydrologic properties of Tertiary and Upper Cretaceous formations pertinent to the Floridan aquifer system in southeast Georgia and adjacent parts of Florida and South Carolina

System	Serie	Gulf Coast stage	NORTHEAST FLORIDA AND EXTREME SOUTHEAST GEORGIA			SOUTHEAST GEORGIA			SOUTHERN SOUTH CAROLINA			UPDIP GEORGIA AND SOUTH CAROLINA		
			Stratigraphic unit	Lithology	Hydrologic properties	Stratigraphic unit	Lithology	Hydrologic properties	Stratigraphic unit	Lithology	Hydrologic properties	Stratigraphic unit	Lithology	Hydrologic properties
Quaternary	Holocene and Pleistocene		Alluvium and terrace deposits	Chiefly sand, gravel, clay, shells, limestone, and marl	Low to moderate yields	Alluvium and terrace deposits	Chiefly sand, gravel, and clay, poorly sorted, partially indurated	Low yields. Potential source of moderate quantities of water where deposits are hydraulically connected to streams	Alluvium and terrace deposits	Chiefly sand, gravel, and clay, poorly sorted, partially indurated	Low yields	Alluvium, terrace deposits and residuum	Chiefly sand, gravel, and clay, poorly sorted and partially indurated	Low yields
Tertiary	Pliocene		Charlton Formation	Shells, sand, and marl	Low to moderate yields	Citronelle equivalent	Chiefly sand, gravel, and clay	Moderate to large yields	Raysor Formation	Buff, sandy, friable shell marl and loose sand	Low yields	Undifferentiated alluvium	Reddish-yellow to brown clayey sand, sand and gravel, poorly sorted	Low yields
						Charlton Formation and Raysor Formation	Fine sand interbedded with clay and marl which is in some places	Low yields						
	Miocene		Hawthorn Formation	Chiefly interbedded sand, clay, and dolomite, and sandy phosphatic dolomite and marl	Low to moderate amounts of artesian and nonartesian water. Most of the Hawthorn forms the upper confining unit for the underlying artesian water, but in places, the lower part may be hydraulically connected to the Upper Floridan aquifer	Hawthorn Formation	Marl, clay, sand, dolomite, interbedded with pale to dark-green phosphatic sandy clay and sandy dolomite	Low to moderate amounts of artesian and nonartesian water. Most of the Hawthorn forms the upper confining unit for the underlying artesian water, but the lower part may be hydraulically connected to the Upper Floridan aquifer	Hawthorn Formation	Phosphatic sandy clay to phosphatic clayey sand; sandy dolomitic limestone interbedded with layers of hard brittle clay resembling stratified fuller's earth	Yields moderate supplies of good-quality water; clay layers act as confining layer for the underlying artesian aquifer	Hawthorn Formation	Greenish-gray sandy clay and clayey sand, very poorly sorted, containing lenses of gravel and thin beds of sand	Moderate yields from permeable parts; clay layers of low permeability act as the confining layer for the underlying Floridan aquifer system
	Oligocene	Chickasawhayan	Suwannee Limestone	Limestone ranging from soft, chalky, and fossiliferous to dense, calcified, saccharoidal, and unfossiliferous, containing many solution cavities in recharge area	Yields moderate to large amounts of water, but generally less than underlying Eocene formations. Uppermost unit of the Floridan aquifer system	Suwannee Limestone	Limestone ranging from soft, chalky, and fossiliferous to dense calcitized saccharoidal and unfossiliferous	Yields as much as 500 gal/min. The water is artesian except in outcrop areas. Large supply to wells in the Valdosta area. Uppermost unit of the Floridan aquifer system	Cooper Formation (upper part)	Yellowish, soft, chalky limestone to grayish-green to brown phosphatic, sandy, marl	Little or no yield	Cooper Formation (part)	Yellowish-green to brown sandy, clayey marl	Little or no yield
	Upper Eocene	Jacksonian	Ocala Limestone	White to gray, fossiliferous, recrystallized, porous limestone containing large solution cavities and caves in recharge area as well as at depth down-gradient	Prolific aquifer; yields as much as 7,500 gal/min from two distinct water-bearing zones near the top and base of the formation	Cooper Formation	Consists of grayish-green to brown phosphatic, sometimes sandy, marl in eastern Georgia	Insignificant yields	Cooper Formation (lower part)	Light gray to white, silty, sandy phosphatic, clayey limestone	Yields moderate to large amounts of water. Uppermost unit of the Floridan aquifer system	Barnwell Formation	Deep-red to brown, fine to coarse massive sandy clay and clayey sand, well sorted. Scattered thin layers of silicified fossiliferous limestone	Moderate yields from permeable, sorted sand-clastic facies of the Upper Floridan aquifer
						Ocala Limestone	White to gray, fossiliferous, recrystallized, porous limestone containing large solution cavities. In the Valdosta, Georgia, area, lower part mineralized with gypsum and other evaporites, eliminating effective permeability	Extremely prolific water-bearing rock. Major part of the Floridan aquifer system. Yields as much as 13,000 gal/min from secondary permeability solution cavities. Low permeability, evaporite-mineralized limestone in the lower part of the formation acts as the lower confining unit of the Floridan aquifer system in the Valdosta, Ga., area						
	Middle Eocene	Claibornian	Avon Park Formation	Cream-colored to brown, chalky to well indurated, pelletal to micritic limestone interbedded with cream-colored to dark-brown, fine to medium crystalline, slightly vuggy dolomite	Not a significant contributor to the Floridan aquifer system in southeast Georgia. Yields moderate to large amounts of water in northeast Florida where the dolomite contains secondary permeability solution cavities	Gosport equivalent	Calcareous sand or very sandy limestone, fossiliferous and glauconitic at depth	Lowest formation of the Floridan aquifer system where permeable (coastal area-east Georgia). Moderate yields	Santee Limestone	Pure white to creamy-yellow fossiliferous and partly glauconitic limestone containing numerous bryozoans	Moderate to high yields from two distinct water-bearing zones: an upper permeable zone, including the lower part of the Cooper Formation, and a lower permeable zone near the base of the formation. Low permeability rocks at the base act as the lower confining unit of the Floridan aquifer system	Huber Formation	Fine to very coarse, white quartz sand; abundant channel-fill deposits and crossbedding; carbonaceous clay and kaolin. Mudstone and siltstone near the base	Moderate to high yields commonly more than 1,000 gal/min. Permeable clastic material is hydraulically contiguous (laterally) with Lower Floridan aquifer. Low permeability layers near the base act as the lower confining unit of the Floridan aquifer system
						Lisbon Formation	Marl, soft, sandy, clayey, glauconitic, and fossiliferous. Medium to coarse well-sorted sand in central and western part of the area	Low permeability. Acts as the lower confining unit of the Floridan aquifer system in the coastal area-east Georgia. Permeable sands are hydraulically connected to and are part of the lower Floridan flow system						
						Tallahatta Formation	Interbedded glauconitic sand and shale, grading to glauconitic argillaceous fossiliferous, sandy limestone	Thick beds of permeable sand are hydraulically part of the Floridan flow system. Beds of low permeability act as the base of the aquifer system						
	Lower Eocene	Sabinian	Oldsmar Formation	Off-white to light-gray micritic limestone, interbedded with gray to light-brown, fine to medium crystalline, commonly vuggy dolomite. In places, contains pore-filling gypsum and thin beds of anhydrite	Upper part acts as a semiconfining bed to basal part, which yields large amounts of water	Undifferentiated	Silt, massive clay, siltstone and mudstone	Extremely low permeability. Acts as lower confining unit of the Floridan aquifer in central part of the area	Fishburne Formation	Calcareous, glauconitic, sand and clay, and sandy, glauconitic fossiliferous limestone	No data			
	Paleocene		Cedar Keys Formation	Gray and cream-colored, dolomitized limestone containing gypsum and anhydrite stringers, to finely crystalline dolomite and anhydrite	Extremely low permeability. Acts as the lower confining unit of the Floridan aquifer system except where permeable in the Brunswick, Ga., area, where it is part of the Lower Floridan aquifer. Contains mineralized water there				Black Mingo Formation	Red to brown sandy clay and partly indurated fine white to yellow sand, gray to black clay and laminated shale	Low permeability clay near the top of the formation acts as the lower confining unit of the Floridan aquifer system in the northeast part of the area			
Cretaceous	Upper	Navarroan	Lawson Limestone	Light-tan to orange, recrystallized, sandy, porous dolostone and calcarenite	Low permeability. Extremely high permeability locally in the Brunswick, Ga., area, where it is part of the Lower Floridan aquifer. Contains highly mineralized water there									
		Tayloran	Undifferentiated	White to cream-colored, argillaceous, soft, chalky limestone to hard, gray, shaly marl	Low permeability. Locally acts as the lower confining unit of the Floridan aquifer system in the Brunswick, Ga., area									

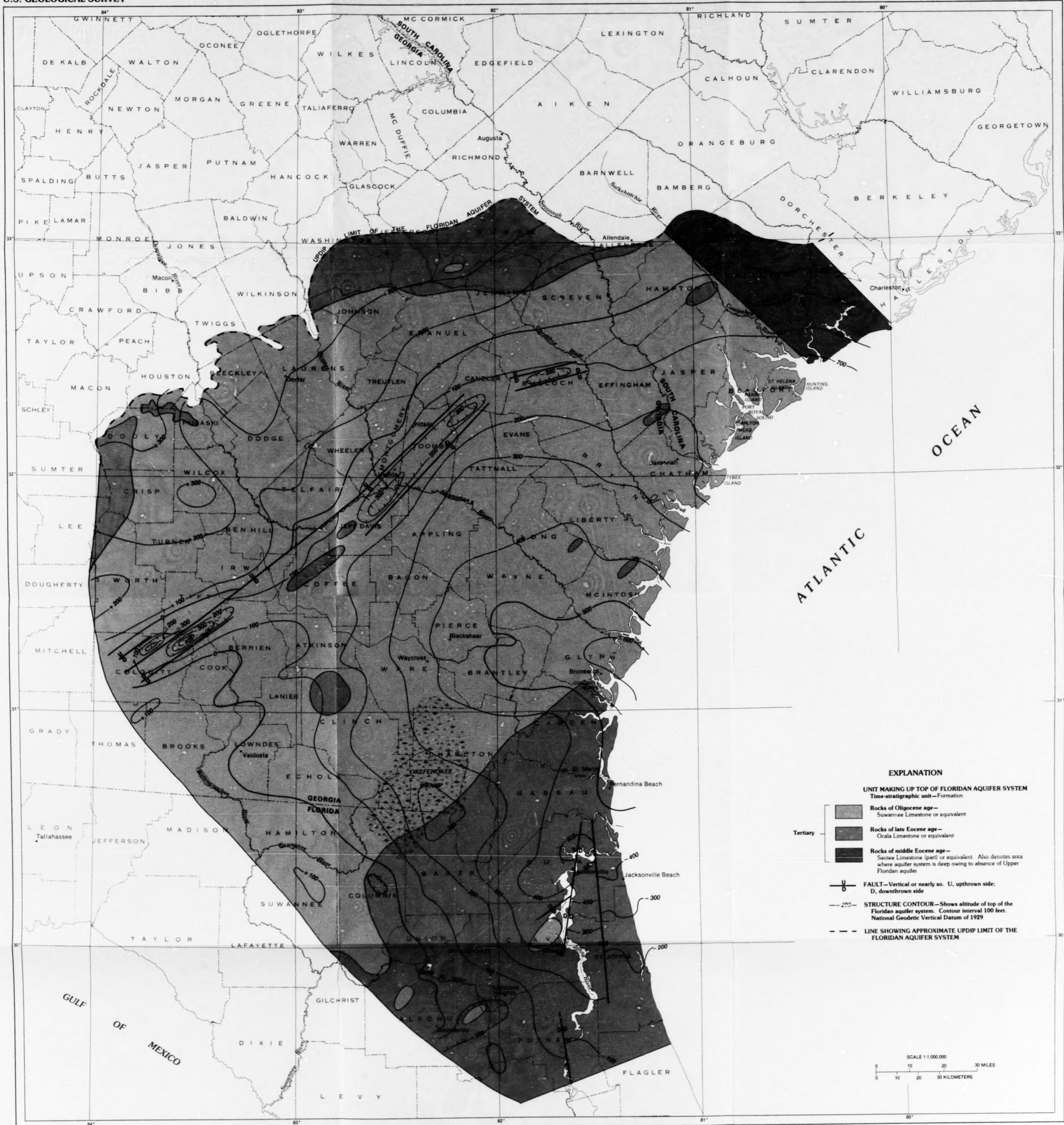
Modified from Stringfield, 1966; C. Darst and others, 1979; and Miller, 1985



Base modified from U.S. Geological Survey
State base maps, 1:500,000: Florida, 1967;
Georgia and South Carolina, 1970

Geology modified from Miller (1982a)

THICKNESS OF THE FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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PLATE 2

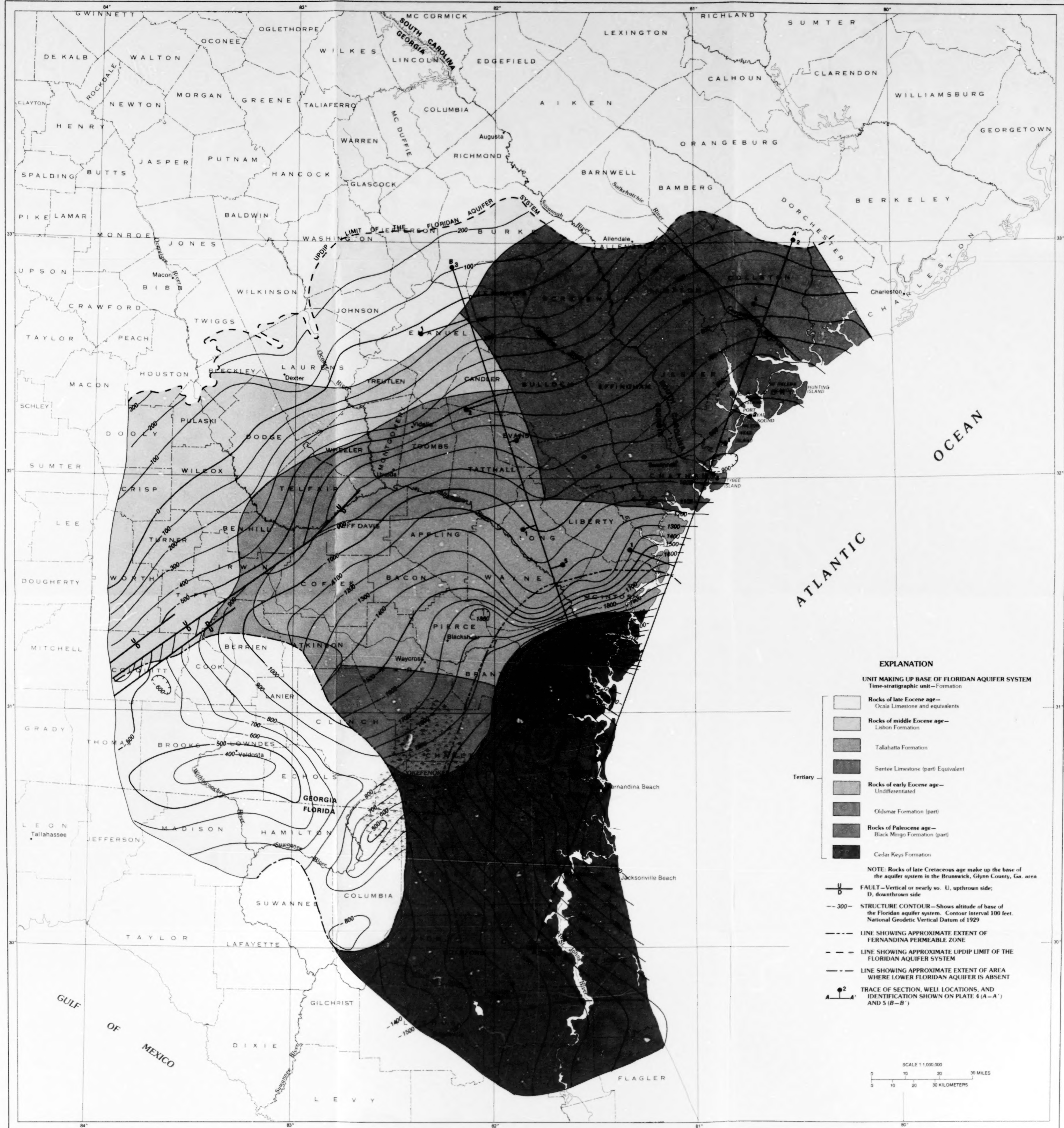
Geology modified from Miller (1982d)

GEOLOGY AND CONFIGURATION OF THE TOP OF THE FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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PLATE 3



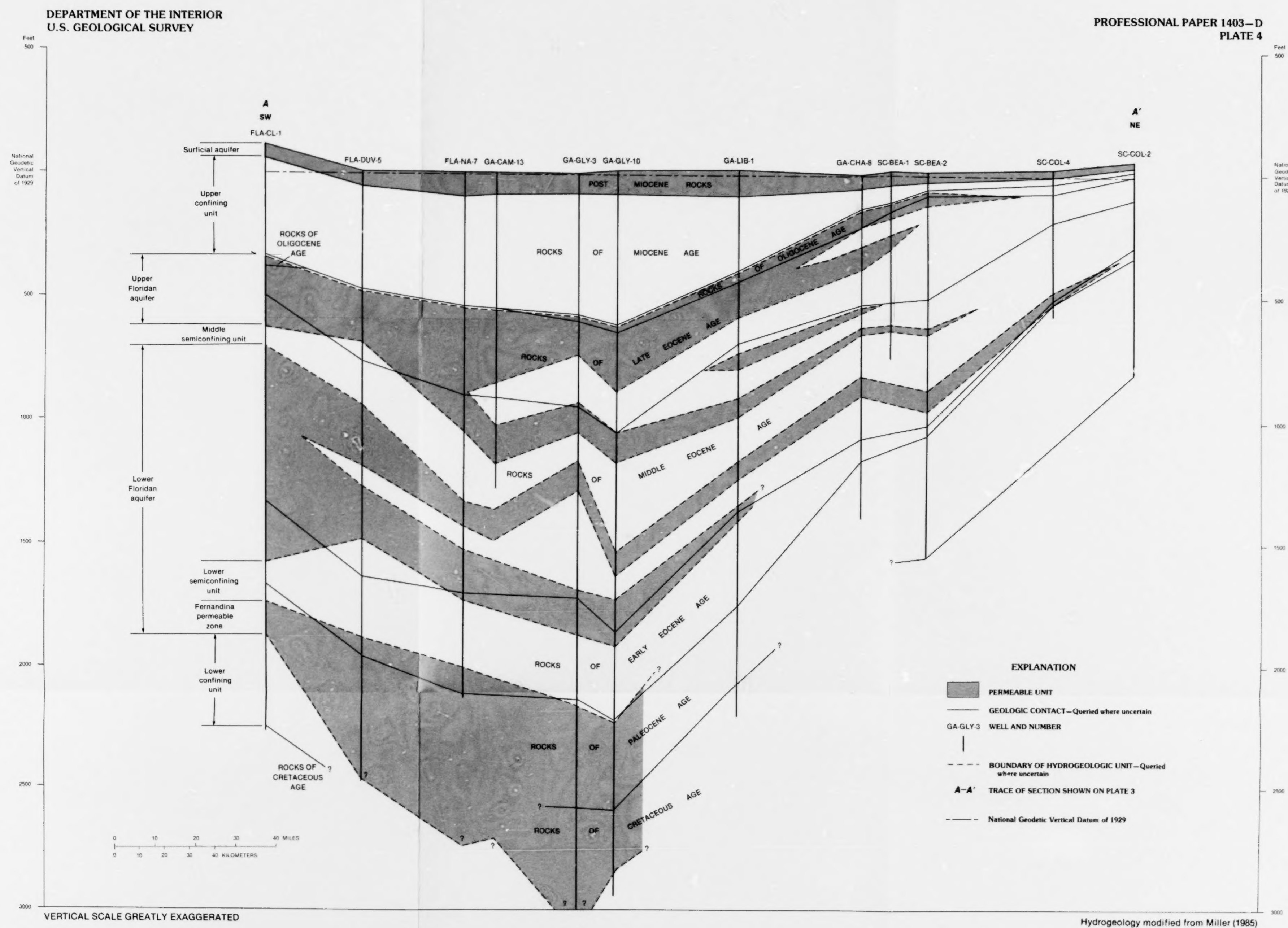
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Georgia and South Carolina, 1970

Geology modified from Miller (1982b)

GEOLOGY AND CONFIGURATION OF THE BASE OF THE FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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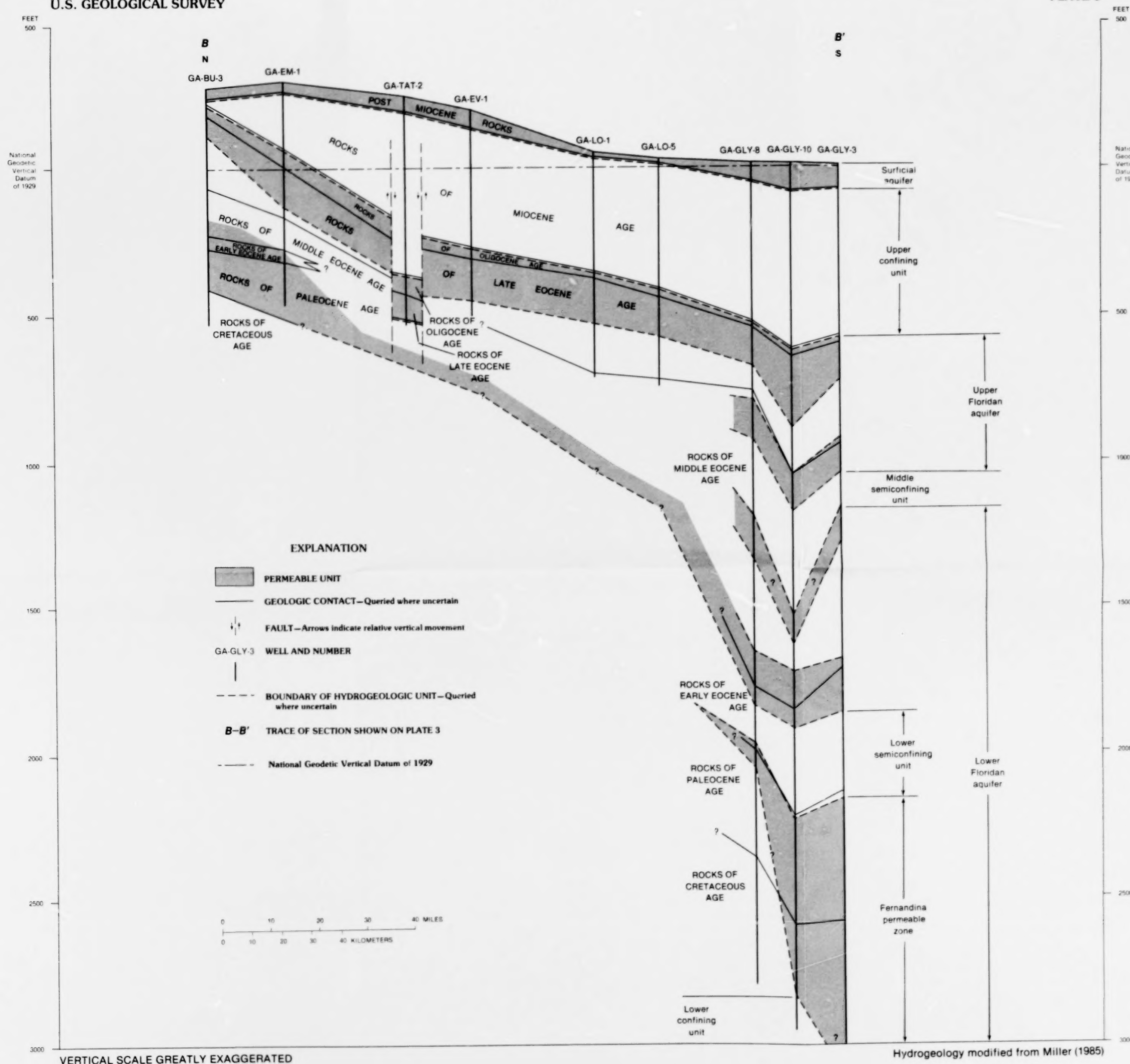
GENERALIZED HYDROGEOLOGIC SECTION SHOWING FLORIDAN AQUIFER SYSTEM ALONG
THE ATLANTIC COAST, NORTHEAST FLORIDA TO SOUTHERN SOUTH CAROLINA

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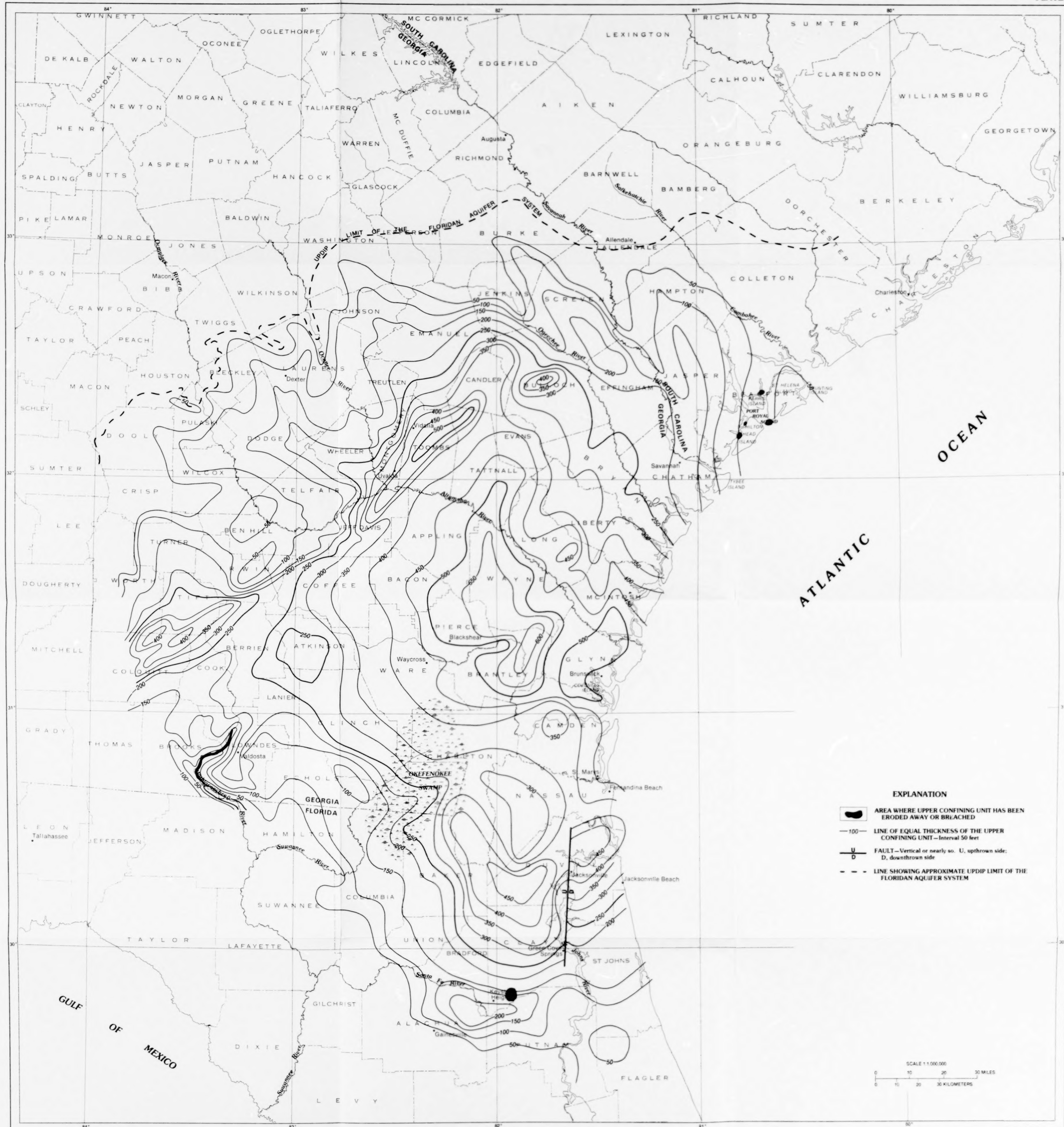
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PLATE 5



GENERALIZED HYDROGEOLOGIC SECTION SHOWING FLORIDAN AQUIFER SYSTEM
APPROXIMATELY ALONG DIP, EAST-CENTRAL TO SOUTHEAST GEORGIA

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Base modified from U.S. Geological Survey
State base maps, 1:100,000. Florida, 1967;
Georgia and South Carolina, 1970

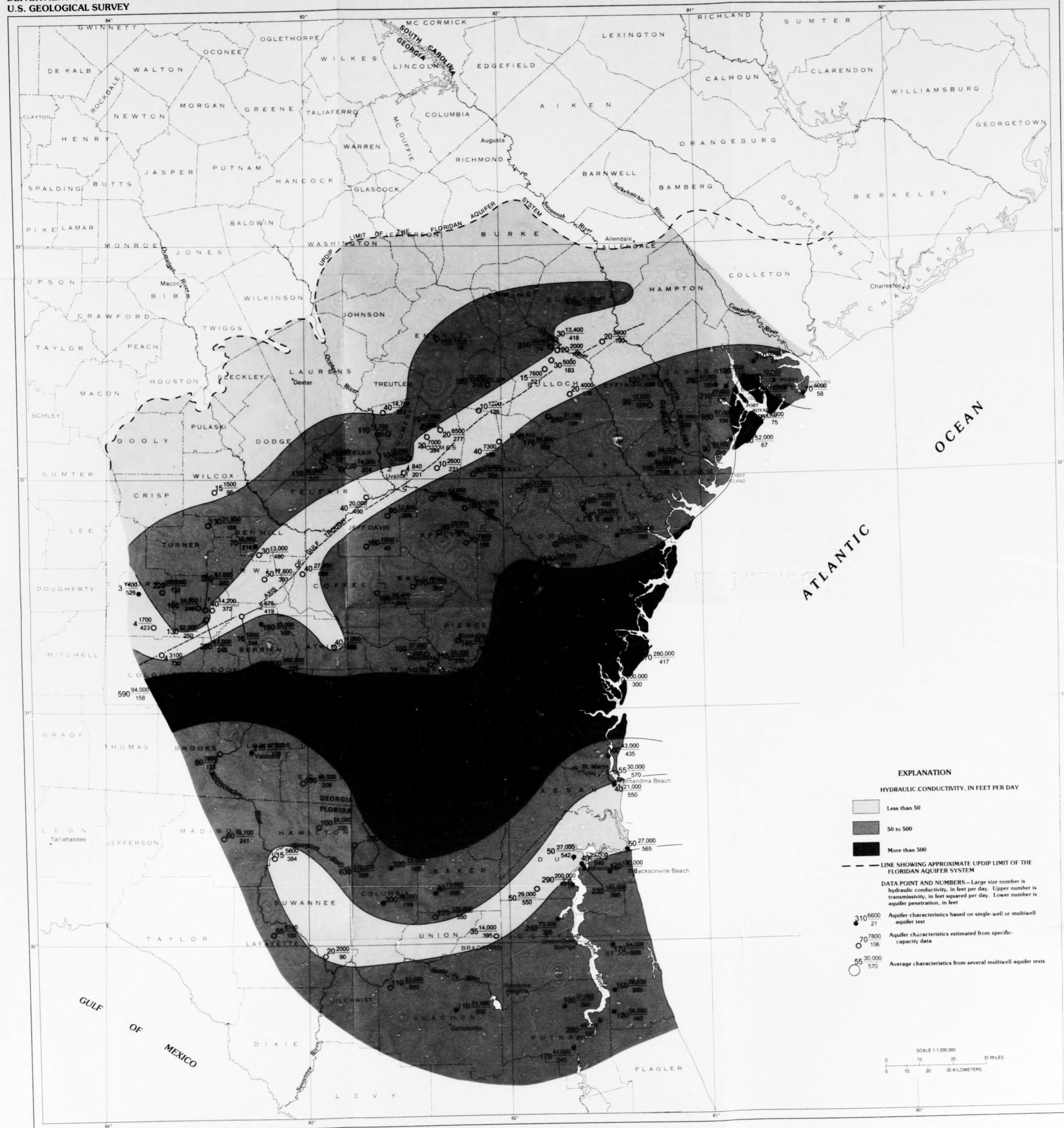
Geology modified from Miller (1985);
Brooks-Lowndes Counties, Ga., area from Krause (1979)

**THICKNESS OF THE UPPER CONFINING UNIT OF THE FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND
ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA**

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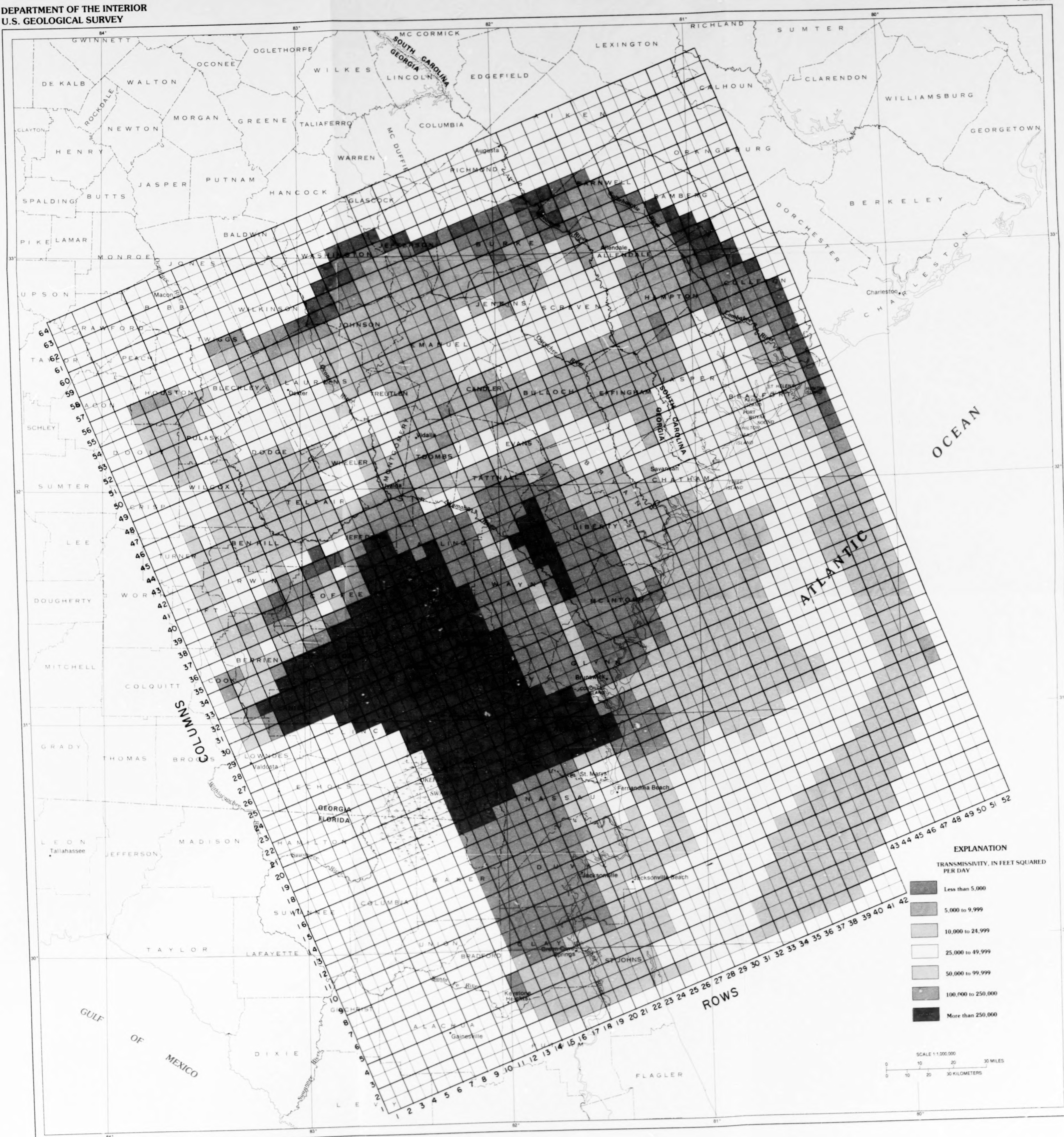
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PLATE 7

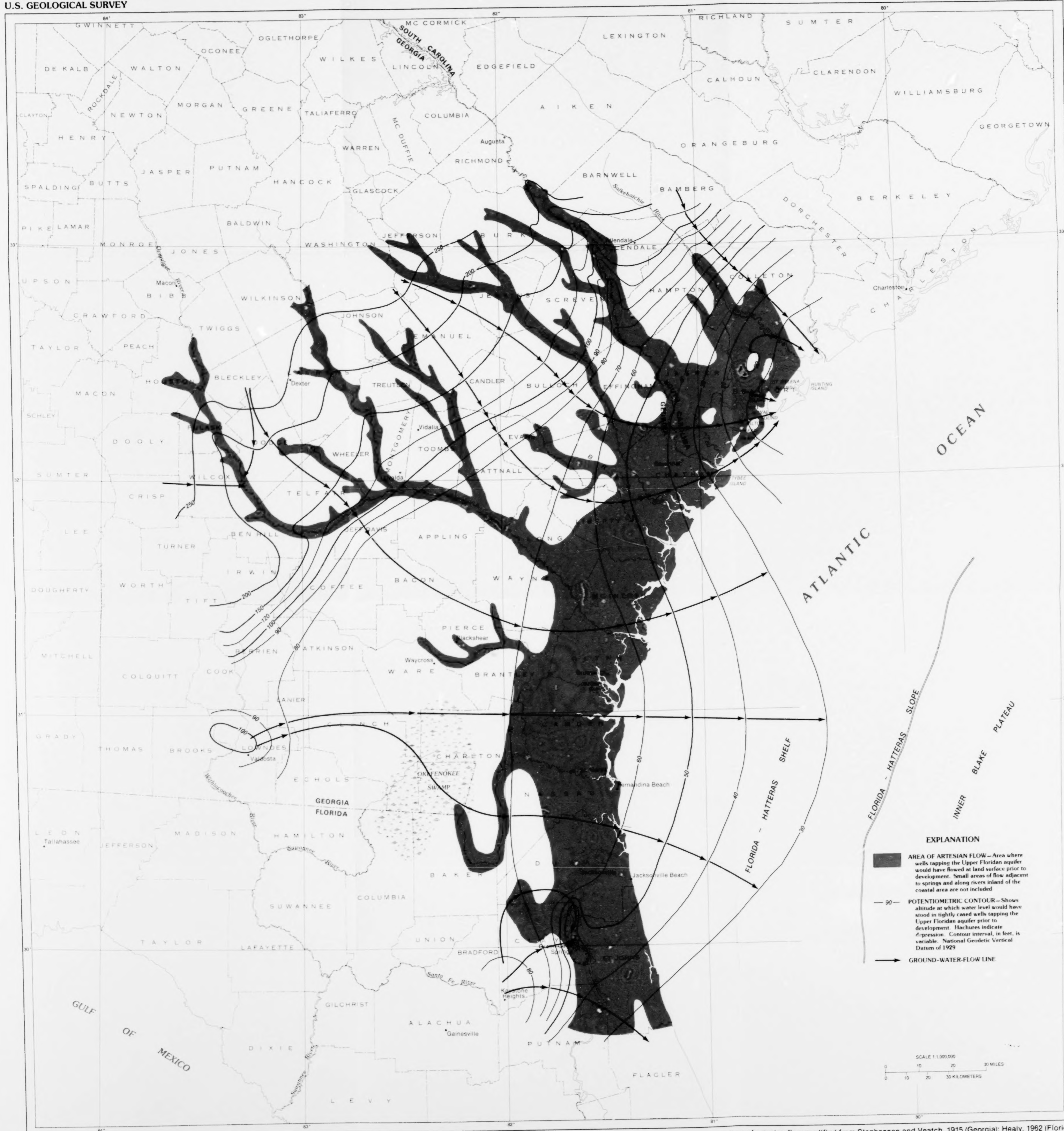


Base modified from U.S. Geological Survey
State base maps, 1:500,000. Florida, 1967;
Georgia and South Carolina, 1970

FIELD VALUES OF HYDRAULIC CONDUCTIVITY AND TRANSMISSIVITY OF THE UPPER FLORIDAN AQUIFER IN
SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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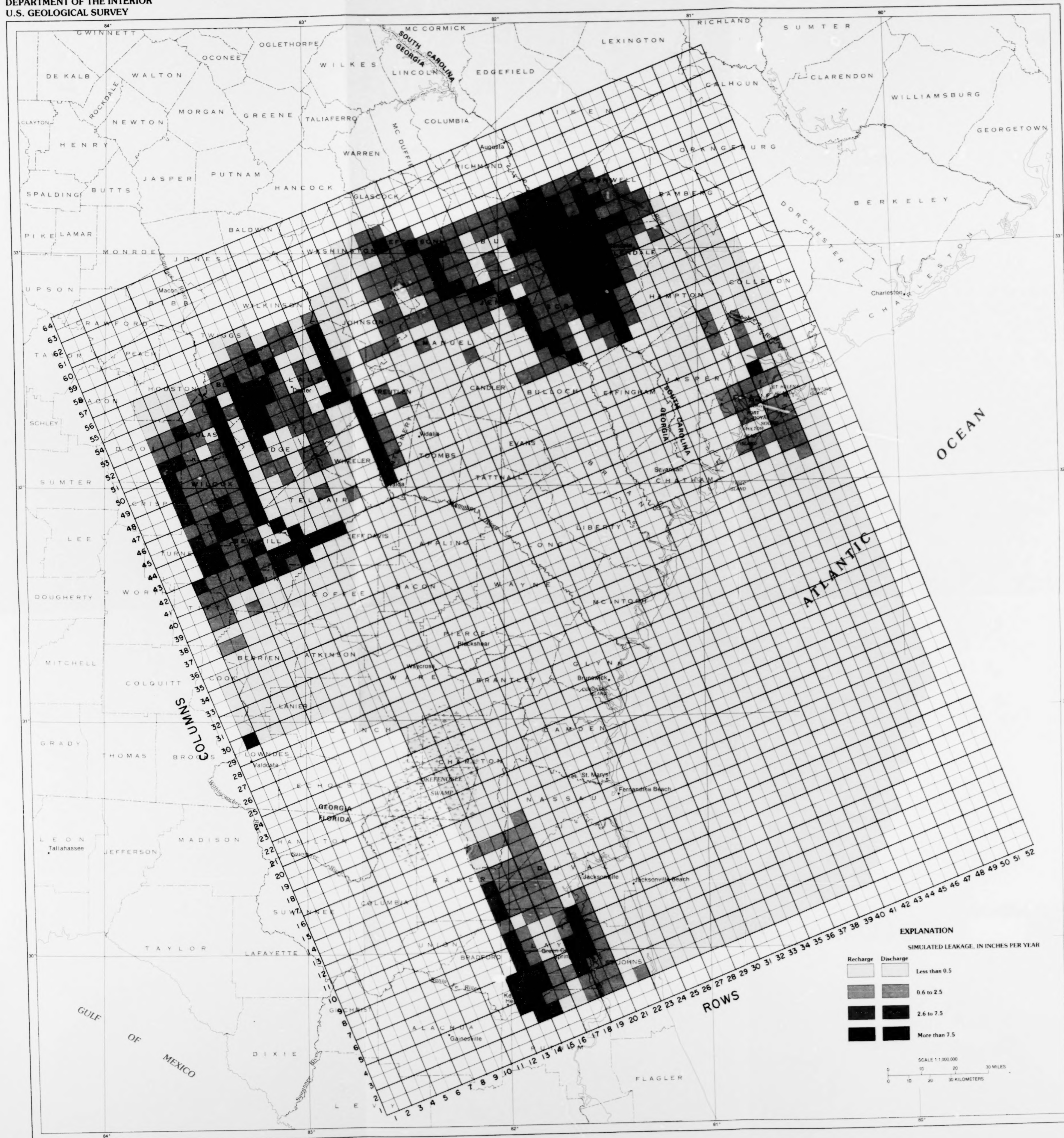
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEYBase modified from U.S. Geological Survey
State base map, 1:500,000 - Florida, 1967;
Georgia and South Carolina, 1970TRANSMISSIVITY DISTRIBUTION, BASED ON SIMULATION, OF THE UPPER FLORIDAN AQUIFER IN
SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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PLATE 9Base modified from U.S. Geological Survey
State base maps, 1:500,000: Florida, 1967;
Georgia and South Carolina, 1970.Area of artesian flow modified from Stephenson and Veatch, 1915 (Georgia); Healy, 1962 (Florida);
Potentiometric contours modified from Johnston and others (1980)ESTIMATED POTENTIOMETRIC SURFACE, AREA OF ARTESIAN FLOW, AND FLOW PATHS FOR THE UPPER FLORIDAN AQUIFER IN
SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA, PRIOR TO DEVELOPMENT

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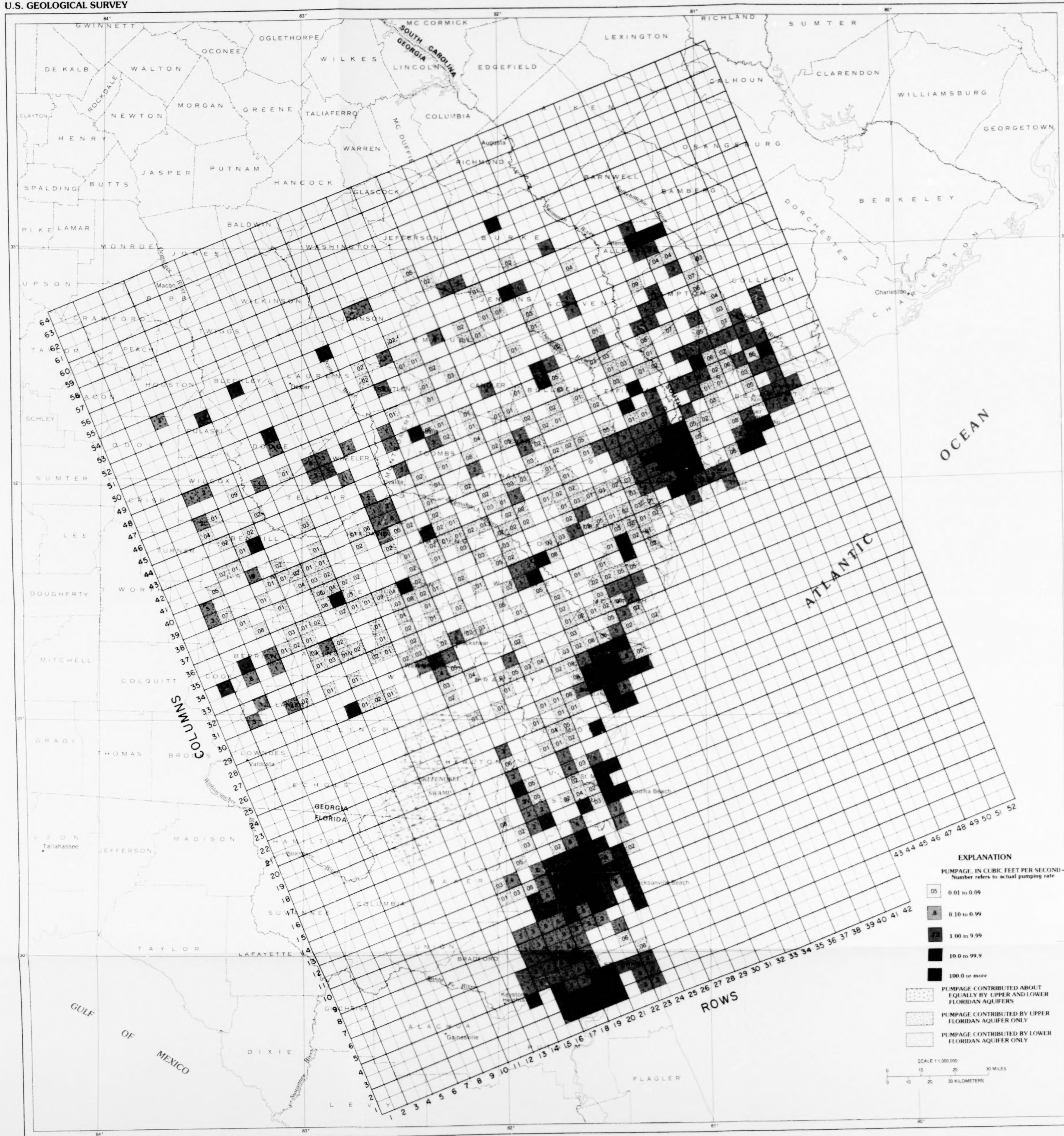
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PLATE 10

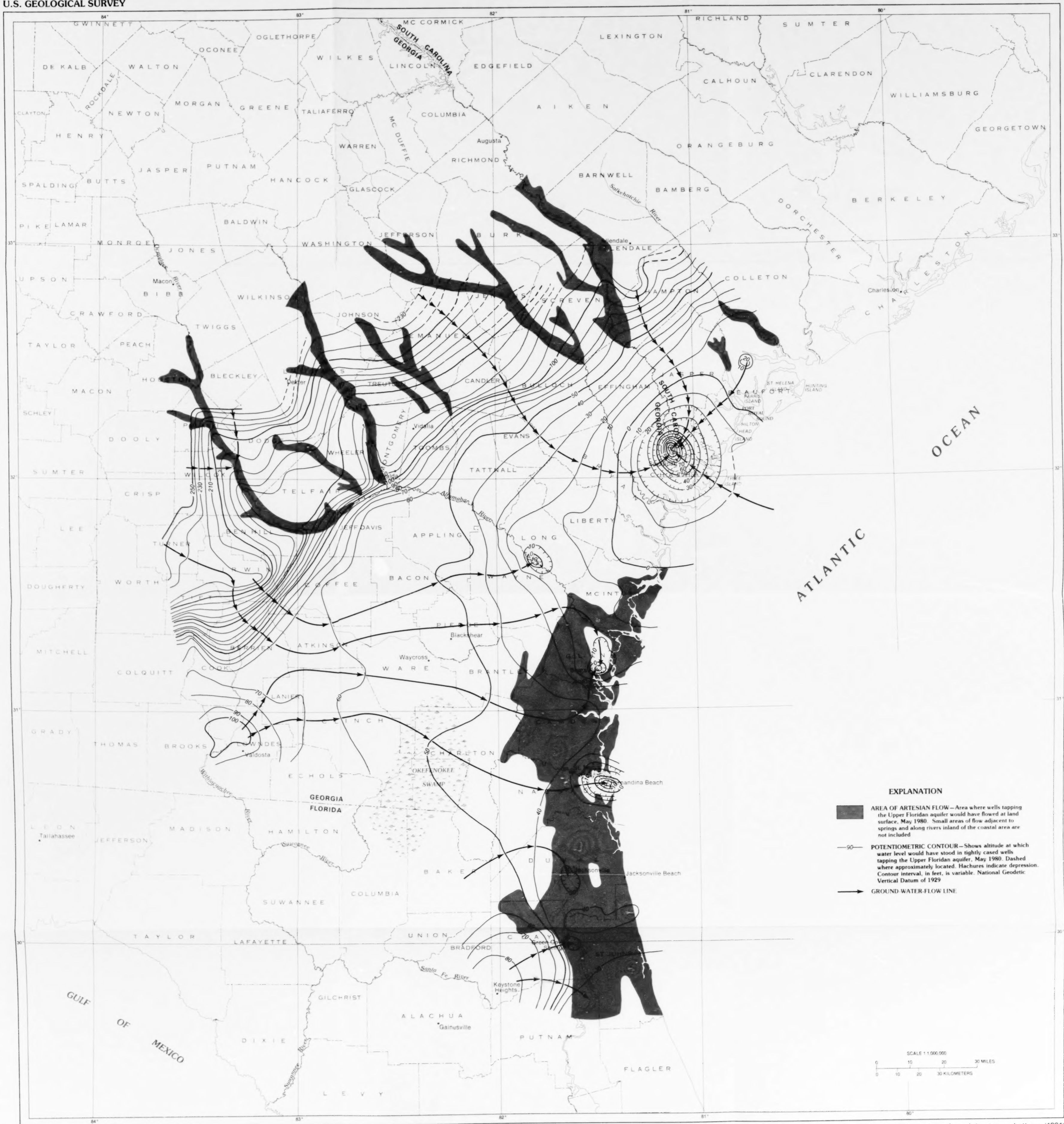


Base modified from U.S. Geological Survey
State base maps, 1:500,000, Florida, 1967;
Georgia and South Carolina, 1970

LEAKAGE THROUGH THE UPPER CONFINING UNIT, BASED ON SIMULATION OF THE PREDEVELOPMENT FLOW SYSTEM OF THE
FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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PLATE 11Base modified from U.S. Geological Survey
State base maps 1:500,000: Florida, 1967;
Georgia and South Carolina, 1970DISTRIBUTION OF PUMPAGE, FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND
ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA, MAY 1980



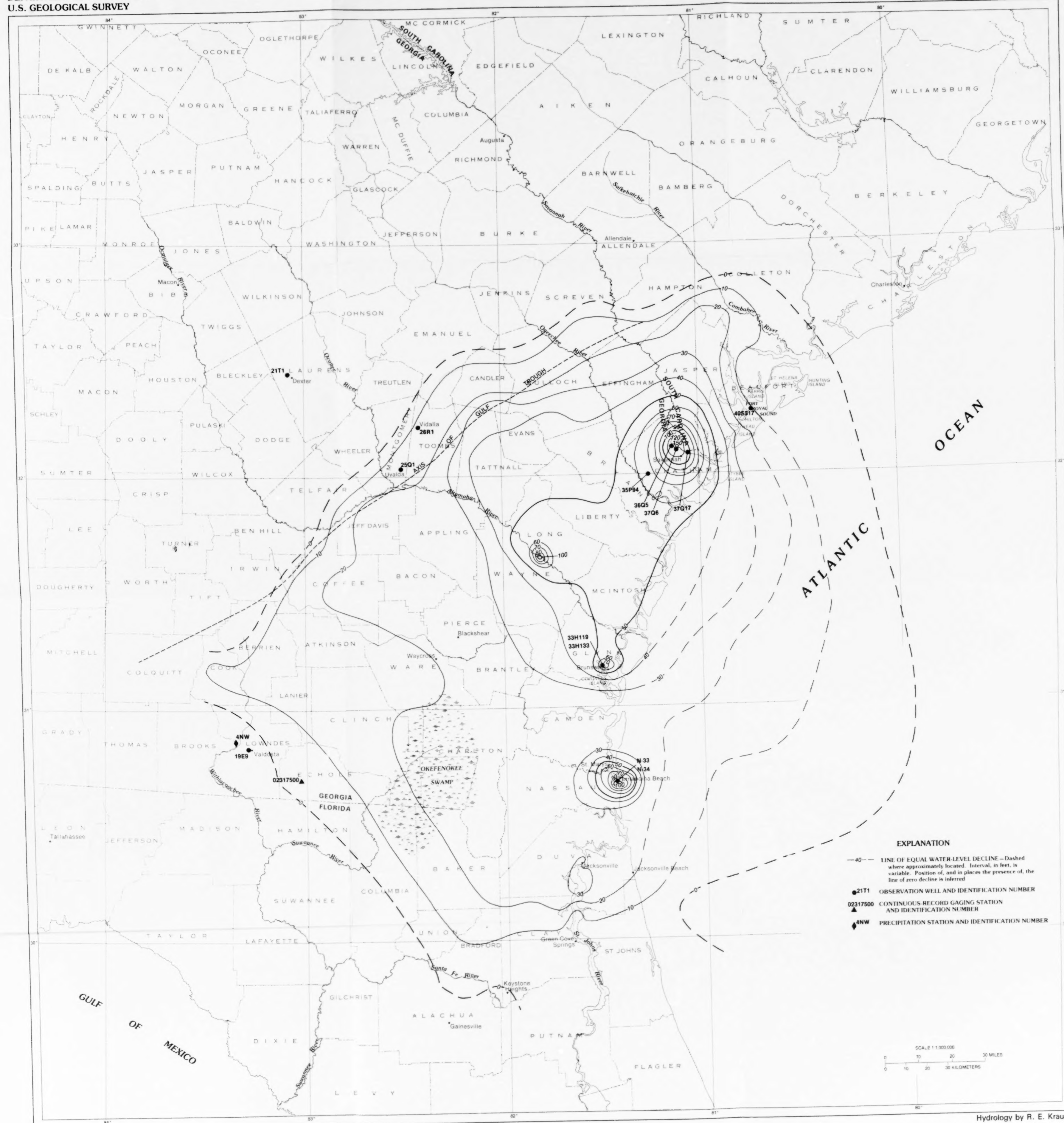
Base modified from U.S. Geological Survey
State base maps, 1:500,000. Florida, 1967;
Georgia and South Carolina, 1970.

POTENTIOMETRIC SURFACE, AREA OF ARTESIAN FLOW, AND FLOW PATHS FOR THE UPPER FLORIDAN AQUIFER
IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA, MAY 1980

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Base modified from U.S. Geological Survey
State base maps, 1:500,000. Florida, 1967;
Georgia and South Carolina, 1970.

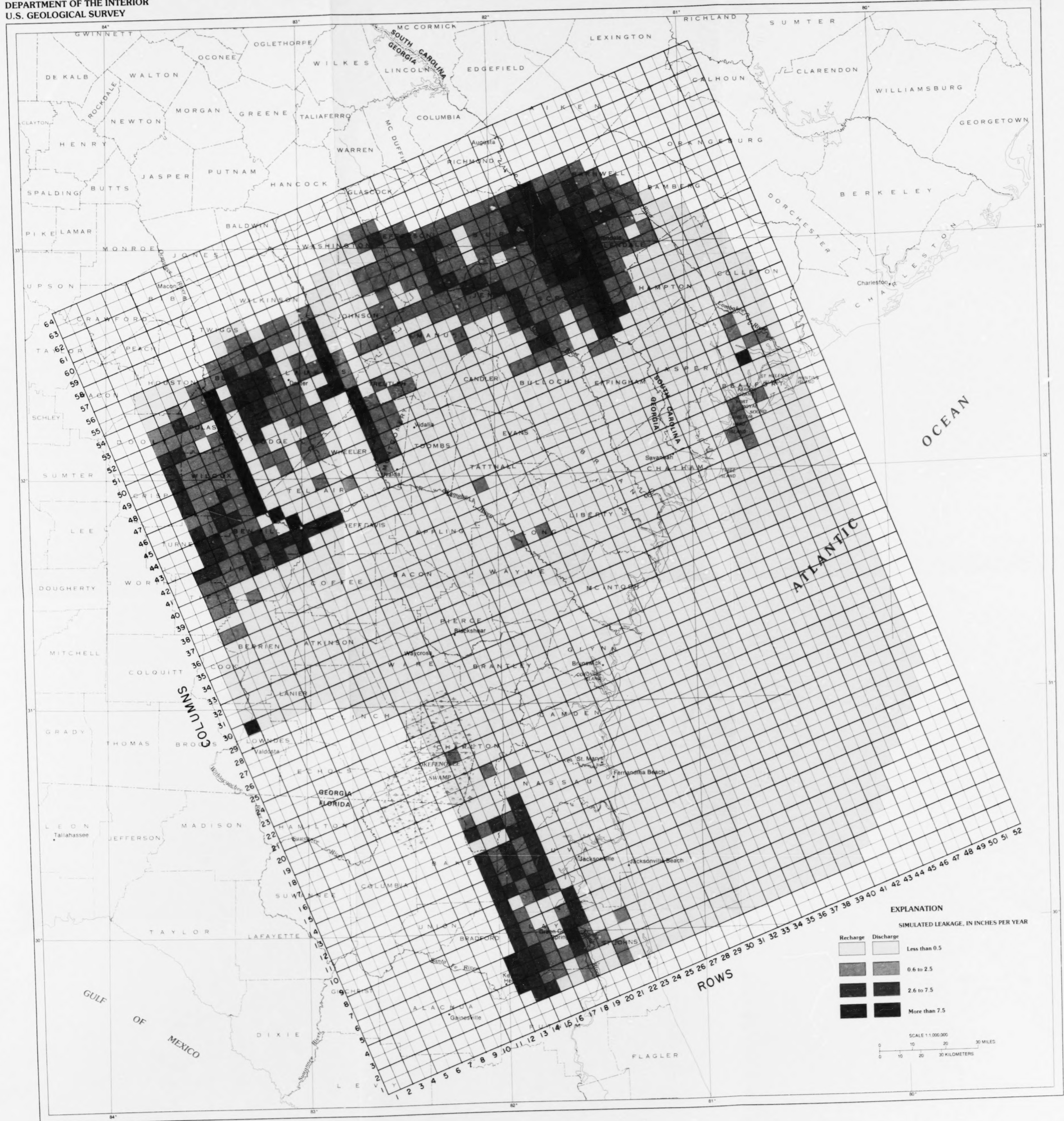
Hydrology by R. E. Krause
Modified from Johnston and others (1980; 1981)

**DECLINE IN THE POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER FROM PREDEVELOPMENT (1880) TO
PRESENT-DAY (1980) CONDITIONS IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA**

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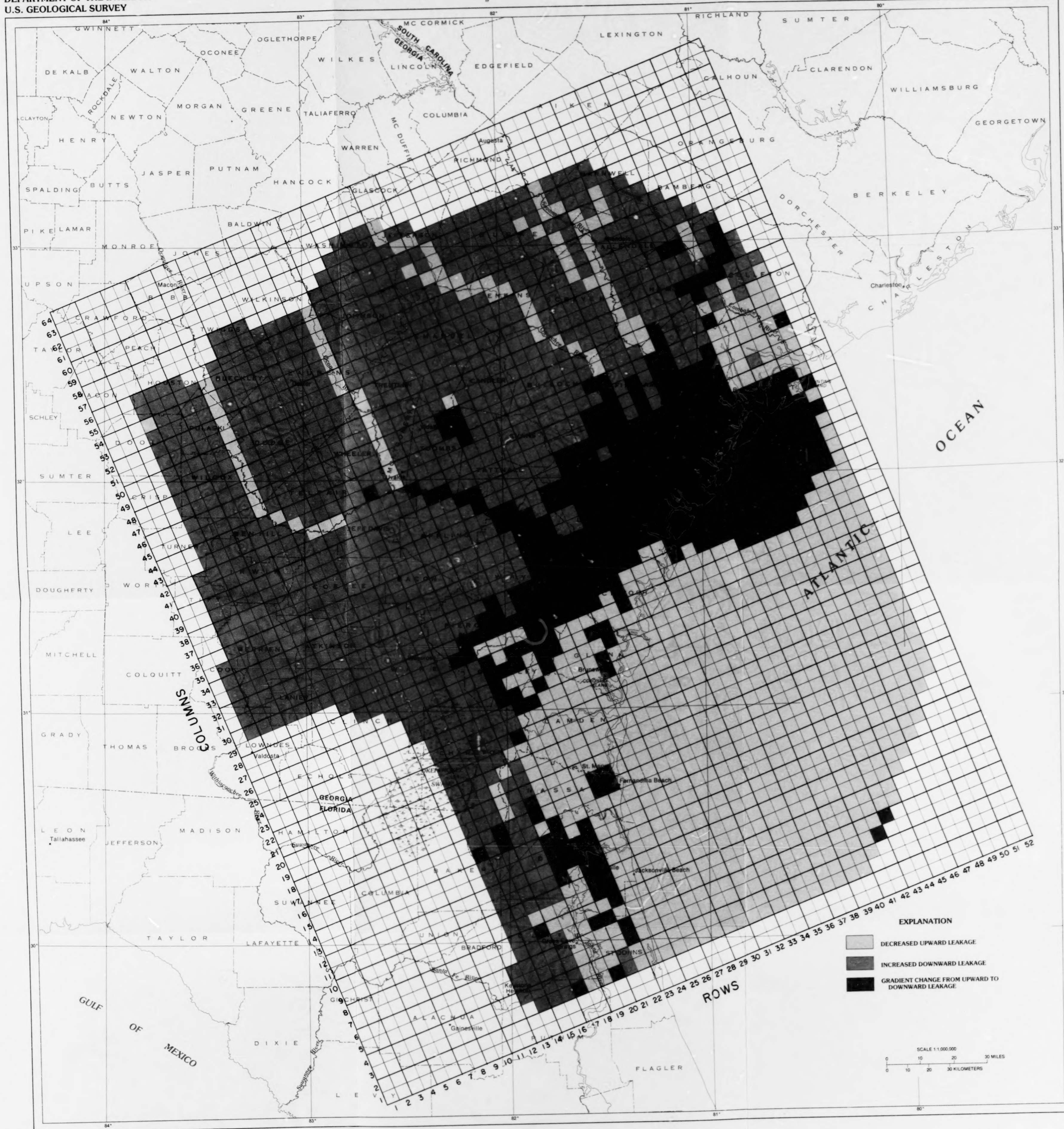


Base modified from U.S. Geological Survey
State base map, 1:500,000 - Florida, 1967;
Georgia and South Carolina, 1970

LEAKAGE THROUGH THE UPPER CONFINING UNIT, BASED ON SIMULATION OF THE PRESENT-DAY (1980) FLOW SYSTEM OF THE
FLORIDAN AQUIFER SYSTEM IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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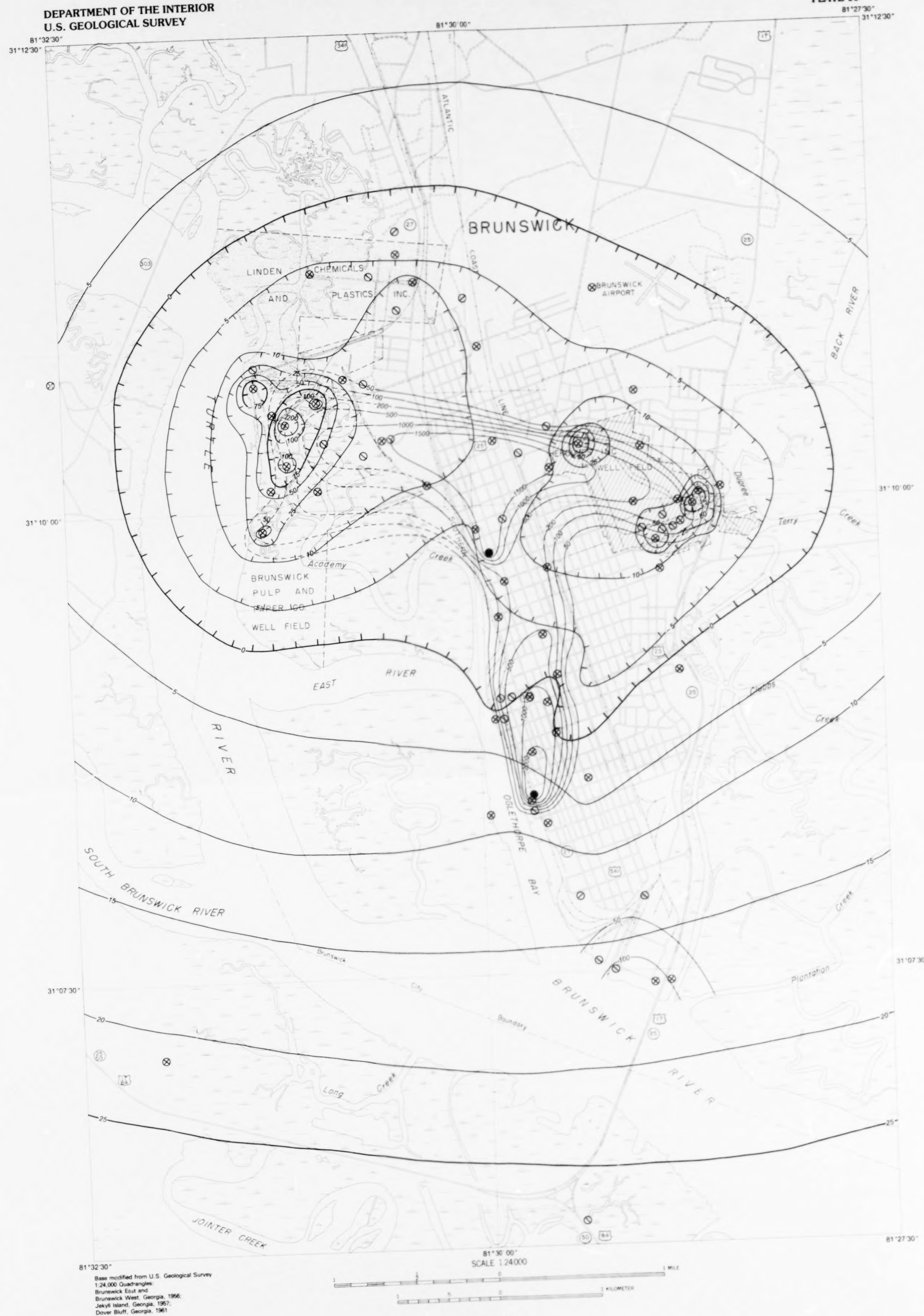
State base maps, 1:500,000 scale, 1967.
Georgia and South Carolina, 1970.

COMPARISON OF SIMULATED LEAKAGE THROUGH THE UPPER CONFINING UNIT OF THE FLORIDAN AQUIFER SYSTEM BETWEEN PREDEVELOPMENT (1880) AND PRESENT-DAY (1980) CONDITIONS IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA

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PLATE 16

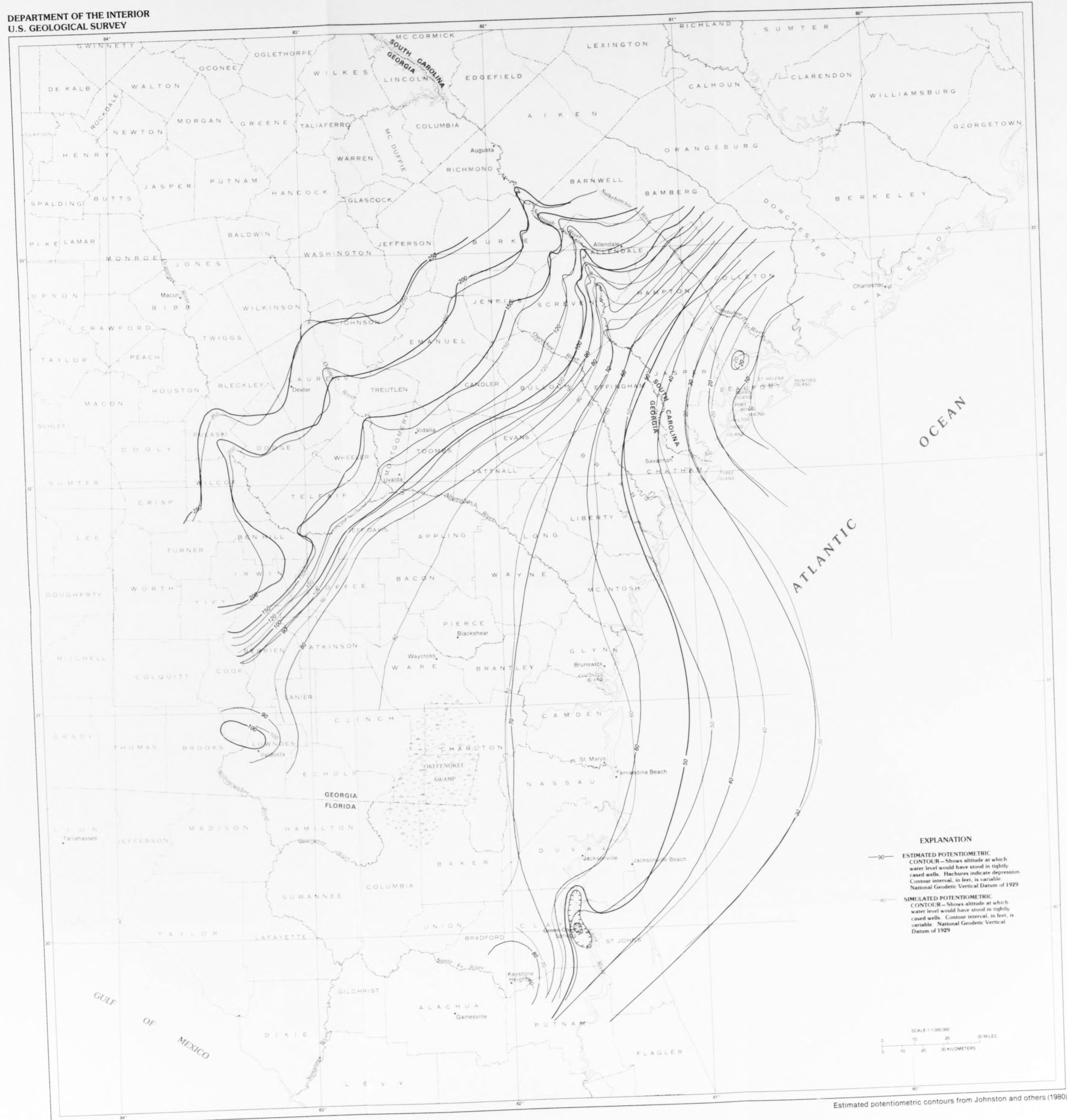


RELATION BETWEEN THE POTENTIOMETRIC SURFACE AND CHLORIDE CONCENTRATION OF
WATER FROM THE UPPER FLORIDAN AQUIFER, BRUNSWICK, GEORGIA, 1980

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PLATE 17

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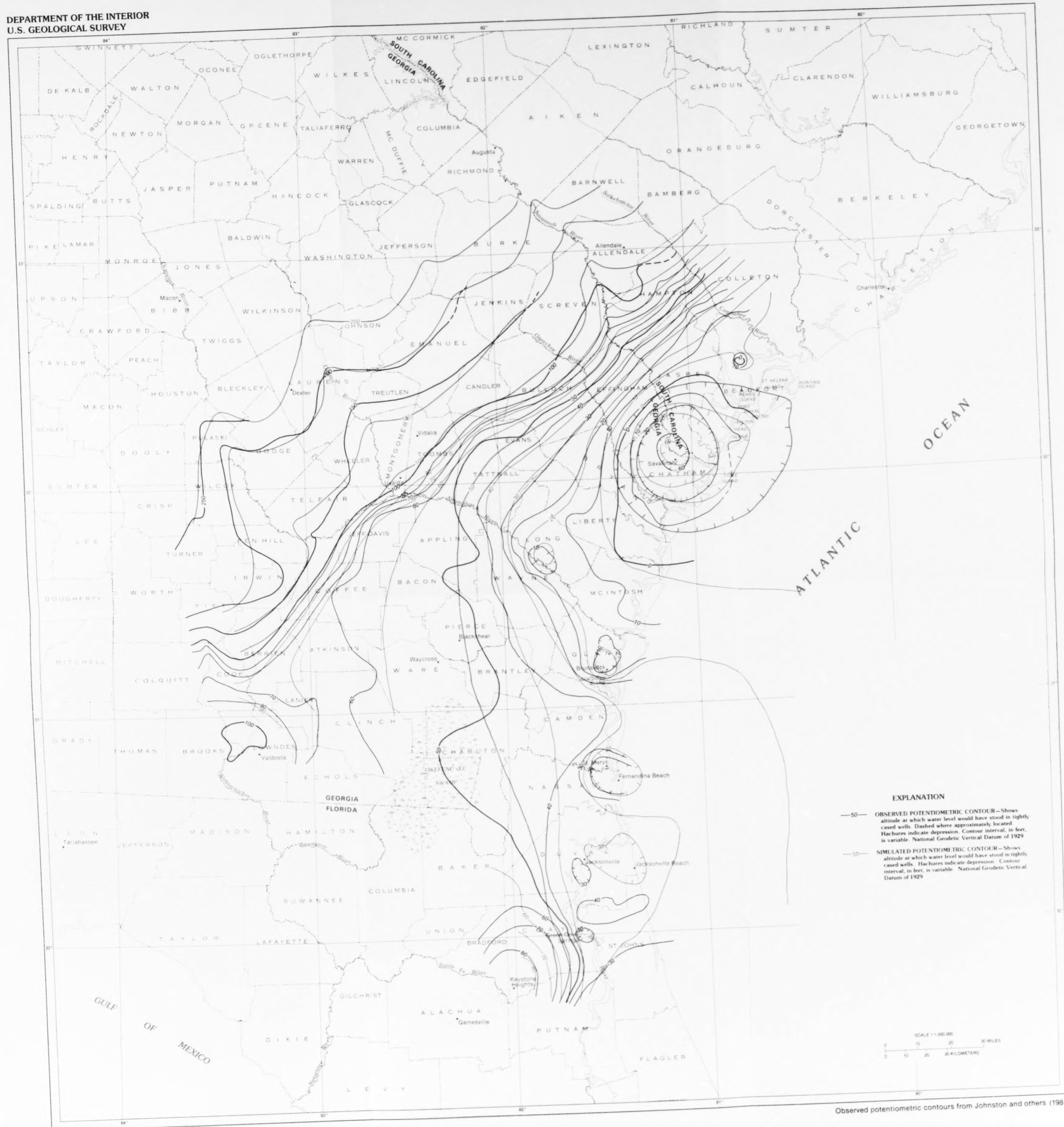
COMPARISON OF ESTIMATED AND SIMULATED POTENTIOMETRIC SURFACES OF THE UPPER FLORIDAN AQUIFER
IN SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA, PRIOR TO DEVELOPMENT

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PROFESSIONAL PAPER 1403-D
PLATE 18

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Base modified from U.S. Geological Survey
State base maps, 1:500,000. Florida, 1967;
Georgia and South Carolina, 1970.

**COMPARISON OF OBSERVED AND SIMULATED POTENTIOMETRIC SURFACES OF THE UPPER FLORIDAN AQUIFER IN
SOUTHEAST GEORGIA AND ADJACENT PARTS OF FLORIDA AND SOUTH CAROLINA, MAY 1980**

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